

# NASA TECH BRIEF



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## Multiple Correlation Computer Program Determines Relationships Between Several Independent and Dependent Variables

One of the main purposes of applying the principles of experimental design to the planning of test programs is to permit the performing of prearranged comprehensive statistical analyses of the program results. If the basic purpose of a test series is the determination of the relationships between several independent and dependent variables, and if only a relatively few tests are available, then it is often useful to employ the techniques of multiple correlation for the design and analysis of the program.

The use of this economical technique is especially suited to rocket engine and component test programs, since it does not require that a prearranged test plan be carried out exactly as planned. As long as a reasonable spread of levels for each of the important independent variables is obtained, multiple correlations can usually be successfully employed, whether specific combinations of these variables were tested or not.

The multiple correlation computer program is a general purpose program that uses the classical method of multiple correlation to estimate  $B_1, B_2, \dots, B_N$  in equation  $X_1 = B_1 + B_2X_2 + B_3X_3 \dots B_NX_N + \epsilon$ .  $X_1$  is the dependent variable,  $X_2, \dots, X_N$  are dependent variables with zero mean and variance  $\sigma^2$ . Each function  $X_j, j = 2, \dots, N$  can contain no more than three independent variables and must have the algebraic form of a simple product, exponential, fractional power, logarithm, or polynomial of degree less than five. Estimates of the regression coefficients and their standard deviations, together with the multiple correlation coefficient, individual correlation coef-

ficients, and partial correlation coefficients are provided in this program. All estimates are statistically evaluated and their associated confidences computed. The program also performs a chi-square test for normality on the residuals to permit evaluation of the normality assumption. An optional procedure to find a final regression with a minimum number of independent functions  $X_j$  and force a linear equation through a particular point is provided for in the program.

### Notes:

1. This program is written in Fortran IV language for use on the IBM 7094 computer.
2. The program has general application to the research and experimental design and development of complex hardware and components that require test programs.
3. Inquiries may be directed to:  
COSMIC  
Computer Center  
University of Georgia  
Athens, Georgia 30601  
Reference: B67-10327

### Patent status:

No patent action is contemplated by NASA.

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